

In the Claims

1. (Original) A semiconductor processing method, comprising:

providing a semiconductor substrate comprising a layer comprising at least one metal in elemental or metal alloy form, the metal comprising an element selected from the group consisting of platinum, ruthenium, rhodium, palladium, iridium, and mixtures thereof; and

etching at least a portion of the layer in a halogenide, ozone and H₂O comprising ambient.

2. (Original) The method of claim 1 wherein the halogenide is provided to the portion of the layer in a liquid solution, and the ozone is provided to the portion of the layer in gaseous form.

3. (Original) The method of claim 1 wherein the ambient comprises a temperature from about 5°C to about 200°C.

4. (Original) The method of claim 1 wherein the ambient comprises a temperature of at least 20°C.

5. (Original) The method of claim 1 wherein the ambient comprises a temperature of at least 60°C.

6. (Original) The method of claim 1 wherein the at least one metal is in elemental form.

7. (Original) The method of claim 1 wherein the at least one metal is in metal alloy form.

8. (Original) The method of claim 1 wherein the at least one metal is in metal alloy form and includes at least two metals selected from the group consisting of platinum, ruthenium, rhodium, palladium and iridium.

9. (Original) The method of claim 1 wherein the at least one metal is in metal alloy form and includes at least one metal selected from the group consisting of platinum, ruthenium, rhodium, palladium and iridium, and at least one other not selected from the group consisting of platinum, ruthenium, rhodium, palladium and iridium.

10. (Original) The method of claim 1 wherein the layer consists essentially of said at least one metal in elemental or metal alloy form.

11. (Original) The method of claim 1 wherein the element comprises platinum.

12. (Original) The method of claim 1 wherein the element comprises ruthenium.

13. (Original) The method of claim 1 wherein the element comprises rhodium.

14. (Original) The method of claim 1 wherein the element comprises palladium.

15. (Original) The method of claim 1 wherein the element comprises iridium.

16. (Original) The method of claim 1 wherein the halogenide is provided to the portion of the layer in a liquid salt solution.

17. (Original) The method of claim 1 wherein the halogenide is provided to the portion of the layer in a liquid salt solution, the liquid salt solution comprising at least one of sodium chloride, potassium chloride and calcium chloride.

18. (Original) The method of claim 1 wherein the halogenide is provided to the portion of the layer in a liquid solution, the liquid solution comprising HCl.

19. (Original) The method of claim 1 wherein the etching ambient comprises atmospheric pressure.

20. (Withdrawn) The method of claim 1 wherein the etching ambient comprises a pressure greater than atmospheric.

21. (Original) A semiconductor processing method, comprising:
providing a semiconductor substrate comprising a layer comprising at least one metal in elemental or metal alloy form, the metal comprising an element selected from the group consisting of platinum, ruthenium, rhodium, palladium, iridium, and mixtures thereof; and

wet etching at least a portion of the layer using an aqueous halogenide ion containing liquid solution and ozone.

22. (Original) The method of claim 21 wherein the wet etching is conducted at a temperature of at least 20°C.

23. (Original) The method of claim 21 wherein the wet etching is conducted at a temperature of at least 60°C.

24. (Original) The method of claim 21 wherein the liquid solution comprises HCl.

25. (Original) The method of claim 21 wherein the liquid solution comprises HCl, and the wet etching is conducted at a temperature of at least 60°C.

26. (Original) The method of claim 21 wherein the liquid solution comprises at least one of sodium chloride, potassium chloride and calcium chloride.

27. (Original) The method of claim 21 wherein the liquid solution and the ozone are provided to the portion of the layer from separate emitters.

28. (Withdrawn) The method of claim 21 wherein the liquid solution and the ozone are provided to the portion of the layer from a common emitter.

29. (Original) The method of claim 21 wherein the element comprises at least one of platinum and rhodium.

30. (Original) A semiconductor processing method, comprising:

providing a semiconductor substrate comprising a layer comprising at least one metal in elemental or metal alloy form, the metal comprising an element selected from the group consisting of platinum, ruthenium, rhodium, palladium, iridium, and mixtures thereof; and

spraying an aqueous halogenide ion containing liquid solution onto the layer and providing gaseous ozone onto the layer during the spraying under conditions effective to etch at least a portion of the layer from the substrate.

31. (Original) The method of claim 30 wherein the element comprises at least one of platinum and rhodium.

32. (Original) The method of claim 30 wherein the liquid solution and the ozone are provided onto the layer from separate emitters.

33. (Withdrawn) The method of claim 30 wherein the liquid solution and the ozone are provided to the portion of the layer from a common emitter.

34. (Original) The method of claim 30 wherein the wet etching is conducted at a temperature of at least 20°C.

35. (Original) The method of claim 30 wherein the wet etching is conducted at a temperature of at least 60°C.

36. (Original) The method of claim 30 wherein the liquid solution comprises HCl.

37. (Original) The method of claim 30 wherein the liquid solution comprises HCl, and the wet etching is conducted at a temperature of at least 60°C.

38. (Original) The method of claim 30 wherein the liquid solution comprises at least one of sodium chloride, potassium chloride and calcium chloride.

39. (Original) The method of claim 30 further comprising spinning the substrate during the spraying.

40. (Withdrawn) A semiconductor processing method, comprising:
forming a layer comprising at least one metal in elemental or metal alloy form over at least one side of a semiconductor wafer, the metal comprising an element selected from the group consisting of platinum, ruthenium, rhodium, palladium, iridium, and mixtures thereof; the wafer having a central portion surrounded by a peripheral portion;
forming masking material over the central portion of the layer while leaving the peripheral portion outwardly exposed; and
etching the peripheral exposed portion of the layer from the wafer using a halogenide, ozone and H₂O comprising ambient while the masking material is received over the central portion.

41. (Withdrawn) The method of claim 40 wherein the masking material comprises organic resist.

42. (Withdrawn) The method of claim 40 wherein the masking material comprises a photoresist.

43. (Withdrawn) The method of claim 40 wherein the masking material is inorganic.

44. (Withdrawn) The method of claim 40 wherein the semiconductor wafer comprises side edges and another side opposite the one side, the method further comprising forming said layer over at least a portion of the side edges and over at least a portion of the another side, the etching removing all of said layer from the side edges and the other side.

45. (Withdrawn) The method of claim 40 wherein the etching comprises wet etching using an aqueous halogenide ion containing liquid solution and gaseous ozone.

46. (Withdrawn) The method of claim 40 wherein the etching comprises spraying an aqueous halogenide ion containing liquid solution onto the masking material and the peripheral exposed portion and providing gaseous ozone onto the masking material and the peripheral exposed portion during the spraying.

47. (Withdrawn) The method of claim 40 wherein the etching is conducted isotropically effective to etch some of the layer beneath the masking material.

48. (Withdrawn) The method of claim 40 wherein the etching is conducted at a temperature of at least 20°C.

49. (Withdrawn) The method of claim 40 wherein the etching is conducted at a temperature of at least 60°C.

50. (Withdrawn) The method of claim 40 wherein the etching comprises a halogenide containing liquid solution comprising HCl.

51. (Withdrawn) The method of claim 40 wherein the etching comprises a chloride containing liquid solution comprising at least one of sodium chloride, potassium chloride and calcium chloride.

52. (Original) A method of forming a capacitor comprising:

forming first and second capacitor electrode layers separated by a capacitor dielectric region over a substrate, at least one of the capacitor electrode layers comprising at least one metal in elemental or metal alloy form, the metal comprising an element selected from the group consisting of platinum, ruthenium, rhodium, palladium, iridium, and mixtures thereof;

forming masking material over a first portion of said at least one capacitor electrode layer while leaving a second portion of said at least one capacitor electrode layer exposed; and

etching the exposed second portion of said at least one capacitor electrode layer using a halogenide, ozone and H₂O comprising ambient while the masking material is received over the first portion effective to form a desired pattern of said at least one capacitor electrode layer.

53. (Original) The method of claim 52 wherein the etching comprises wet etching using an aqueous halogenide ion containing liquid solution and gaseous ozone.

54. (Original) The method of claim 52 wherein the etching comprises spraying an aqueous halogenide ion containing liquid solution onto the masking material and the exposed second portion and providing gaseous ozone onto the masking material and the exposed second portion during the spraying.

55. (Original) The method of claim 52 wherein the etching is conducted isotropically effective to etch some of said at least one capacitor electrode layer beneath the masking material.

56. (Original) The method of claim 52 wherein the etching is conducted at a temperature of at least 20°C.

57. (Original) The method of claim 52 wherein the etching is conducted at a temperature of at least 60°C.

58. (Original) The method of claim 52 wherein the etching comprises a chloride containing liquid solution comprising HCl.

59. (Original) The method of claim 52 wherein the etching comprises a chloride containing liquid solution comprising at least one of sodium chloride, potassium chloride and calcium chloride.